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Image Analysis Algorithm for Detecting Defects in Repetitive Patterns

Disclosed is an image analysis algorithm and software implementation for inspecting identical gray scale images which contain repetitive two-dimensional shapes. Figure 1 shows an image with four equivalent two-dimensional shapes. Figure 2 shows a similar image with a defective shape. The shapes must be the darkest or brightest objects in the image but may exist on a nonuniform background.

The algorithm is based on a reference comparison technique in which parameters from a reference image containing no defects (Figure 1) are compared to parameters from all other images. In actual use, one image from the collection of similar images is chosen as the reference and is guaranteed good by comparison with other images. The comparison parameters are related to the average gray levels in the parts of the image defined by a derived mask. The mask is an area slightly larger than the two-dimensional shape and is divided into regions defining the center, interior, and edge of the shape. The mask is found by averaging the images of the repetitive shapes within a scene and then segmenting the averaged image with an adaptive thresholding technique. Changes in the average gray level of different regions of the mask are used to detect defects.

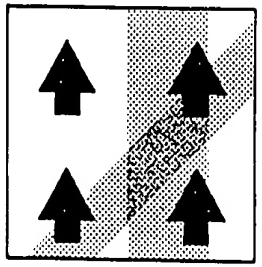

FIG. 1

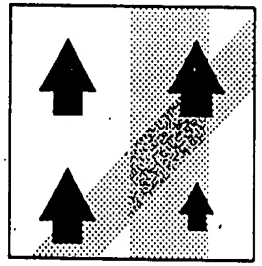

FIG. 2

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High Density Area Array Connector

Disclosed is a process of fabrication of a z-directional high density, high compliance area array connector.

Employing Cu (or Au) wire of 1 mil or less diameter, many parallel metal lines can be weaved in one direction in a conventional fabric weaving tool. Weaving of wires with 1 - 3 mils spacing can be achieved 3-dimensionally. Then high compliant elastomer is cast and cured to form a big block of composite of elastomer and metal wires. If the wires are weaved 2-dimensionally, then elastomer is screened onto the metal wires and cured to form a sheet of the elastomeric composite and then, the sheets are laminated together with elastomer again in between, to form a block of the composite of elastomer and metal wires. Then the composite block of parallel metal lines and elastomer is sliced with angle ranging from 5°to 45°. Contact areas, i.e., cross-sectioned areas of metal lines, are electrolessly Cu or Au plated to form contact bumps, by dipping the sheets of interposers into the electroless plating bath. No seeding is necessary since electroless plating will be selectively achieved onto the conductive metal surface only. Interconnection can be made by placing the area array interposer connector between two components to be connected, and mechanically clamping them, as shown in Figure 1.

Advantages of this interposer connector are: (1) no alignment necessary, since the wire pitch is much smaller than pad size and pitch, (2) contact redundancy for ensuring contact, since multiple contacts for each contact pad can be made, (3) contact wiping during compression, ensuring breaking of any metal oxide on the contact surface, and (4) high compliance with the least of closing force, since no metal bending is associated during compression.

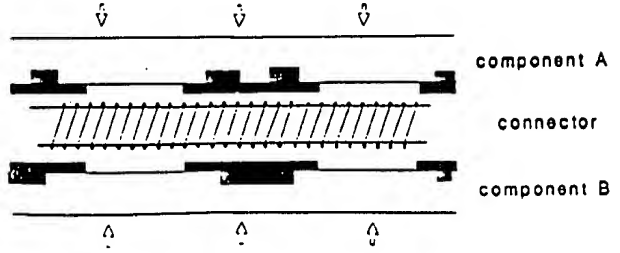

Figure 1, schematic of the area array connector

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